Improving Surface Safety Through Airfield Design

Federal Aviation Administration

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Evolution of Airfield Configuration

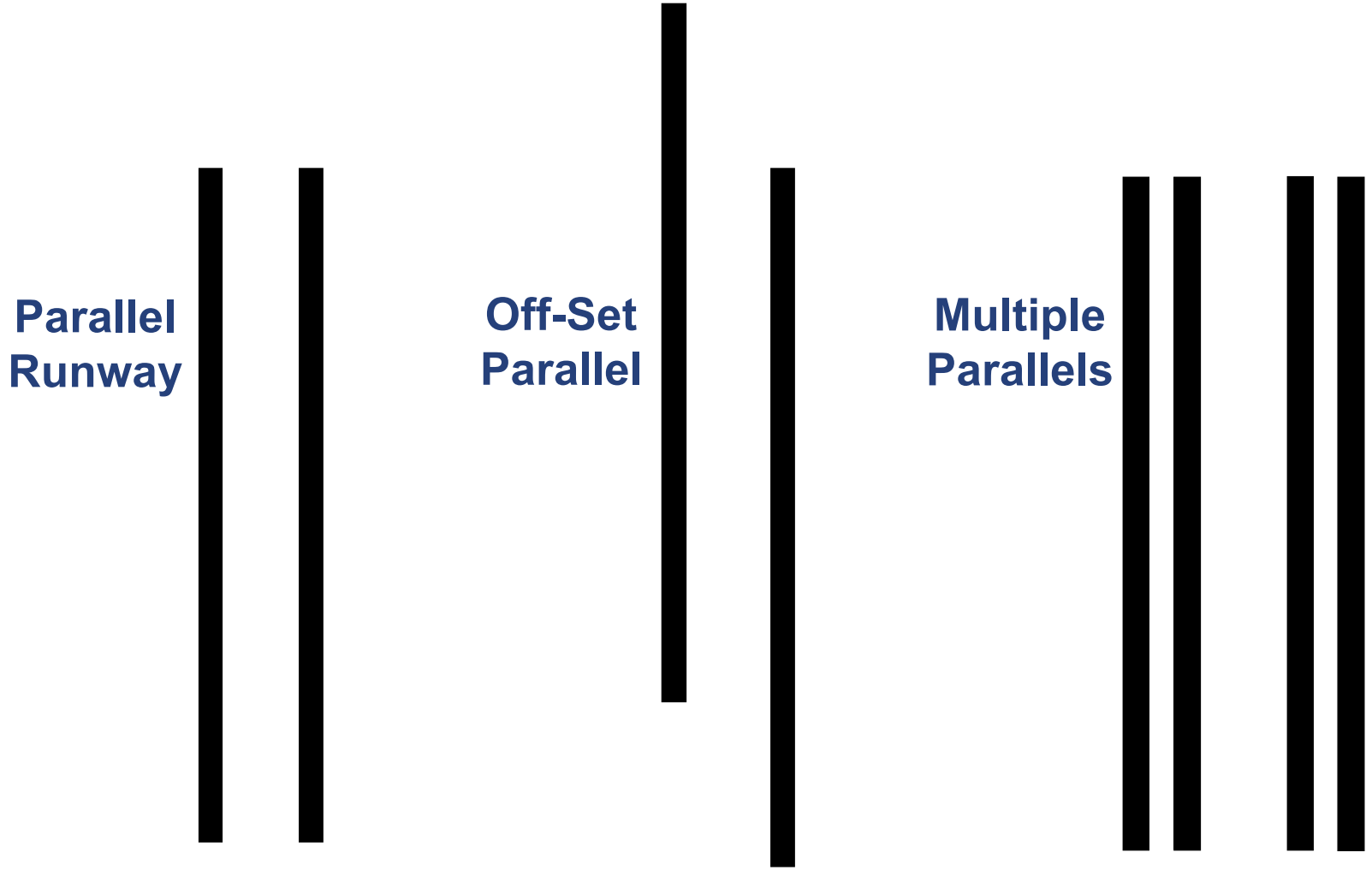
All Direction Landing Field

Single Runway

Intersecting Runway

Non-Intersecting Runway

Airfield Configuration continued



Taxiway Function

- **Provide for aircraft access/egress between apron areas and runways**

Taxiway Design Considerations

- **Number of operations**
- **Number of runway crossings**
- **Location of runway crossings**
- **Taxiway width and surface vs. runway**
- **Other, e.g.,**
  - Aircraft type
  - Terminal/tie down/hangar location

Tenet of Surface Safety

- **The risk of collision between two aircraft on a runway is significantly reduced if there is only one aircraft on the runway.**

Washington National Airport (DCA)

DCA Runway Incursion Opportunities for Departures

	Taxiing Out	Taxiing Onto Dep. R/W	Take Off Roll	TOTAL
Runway 1	1	1	2	4
Runway 4	0	1	2	3
Runway 15	0	1	2	3
Runway 19	1	1	2	4
Runway 22	1	1	2	4
Runway 33	1	1	2	4

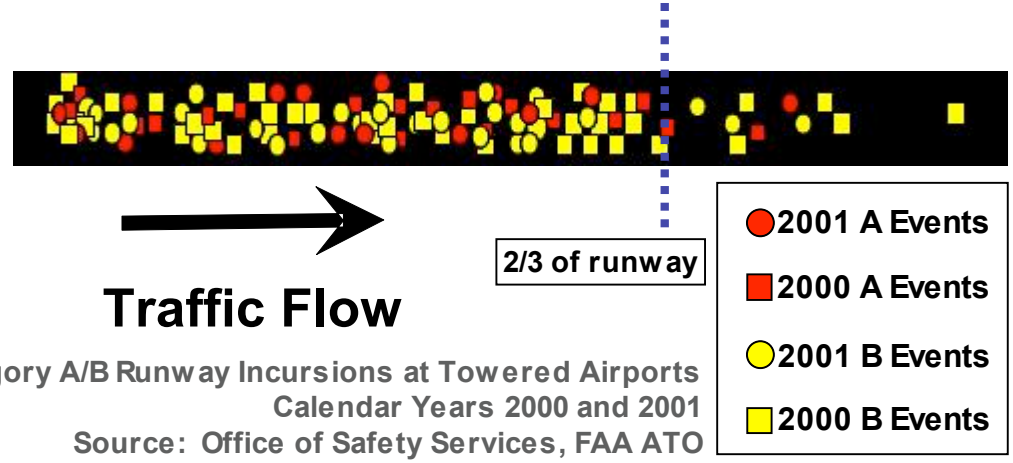
DCA Runway Incursion Opportunities for Arrivals

	Landing rollout	Possible landing roll out	Taxiing	Possible during Taxiing	TOTAL
Runway 1	1	(2)	0	(1)	1(3)
Runway 4	1	(2)	1	(2)	2(4)
Runway 15	1	(2)	1	(2)	2(4)
Runway 19	1	(2)	0	(1)	1(3)
Runway 22	2	0	0	0	2
Runway 33	2	0	0	0	2

Dulles International Airport (IAD)

Suggested Practices for Taxiway-Runway Crossings

- **Minimize number of "active" taxiway-runway crossings**
- **Put "active" taxiway-runway crossings in the last third of the runway whenever practical**
  - Avoid the middle third as much as possible



Category A/B Runway Incursions at Towered Airports
Calendar Years 2000 and 2001
Source: Office of Safety Services, FAA ATO

Estimate of Number of Runway Crossings at Selected Airports

Airport	Estimated Number of Active Crossings per Day[1]
Dallas/Fort Worth	1655
Los Angeles	1198
Atlanta	944

[1]Based on runway crossing survey results

Incursion Rates Associated With Runway Crossings

OEP 35 Airports – Severe Incursions (A&B) Only

Type of Crossing	RIs *	Crossings †	RI Frequency per Million Crossings	Bound ††
Runway-Taxiway Crossings, 1st third	15	6.1 million	2.46	1.15 – 3.77
Runway-Taxiway Crossings, 2nd third	26	13.2 million	1.96	0.94 – 2.99
Runway-Taxiway Crossings, 3rd third	20	14.2 million	1.41	0.49 – 2.33
Intersecting Runway Crossings, 1st third	2	9.6 million	0.21	0.00 – 0.84

* Reported number of Category A and B runway incursions involving taxiway-runway crossings or intersecting runway operations from 1997-2003

† Estimated number of taxiway-runway crossings or intersecting runway operations (based on survey results) during same period

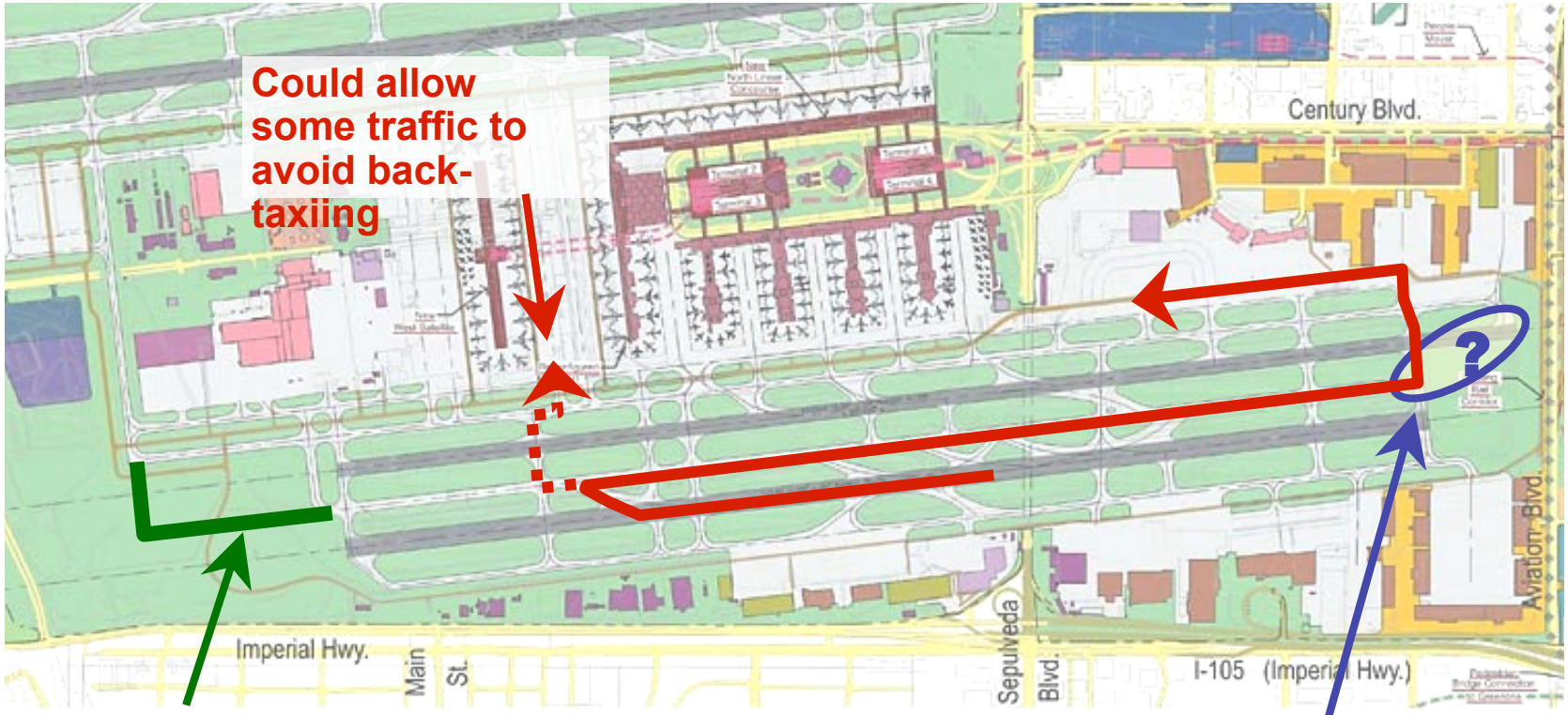
†† 95 percent confidence bounds (for historical average of all 35 airports, assuming a binomial distribution)

Some Taxiway Design Features to Improve Surface Safety

- **Minimize or eliminate angle exits from one runway that cross another runway**
- **Provide end around taxiways**
- **Eliminate bi-directional guidance on exits**

Los Angeles International (LAX)

LAX: Taxi Flow Strategy – South Complex



Could consider construction of end-around taxiway

Could consider taxiway extension so that intersection departures would have more runway available

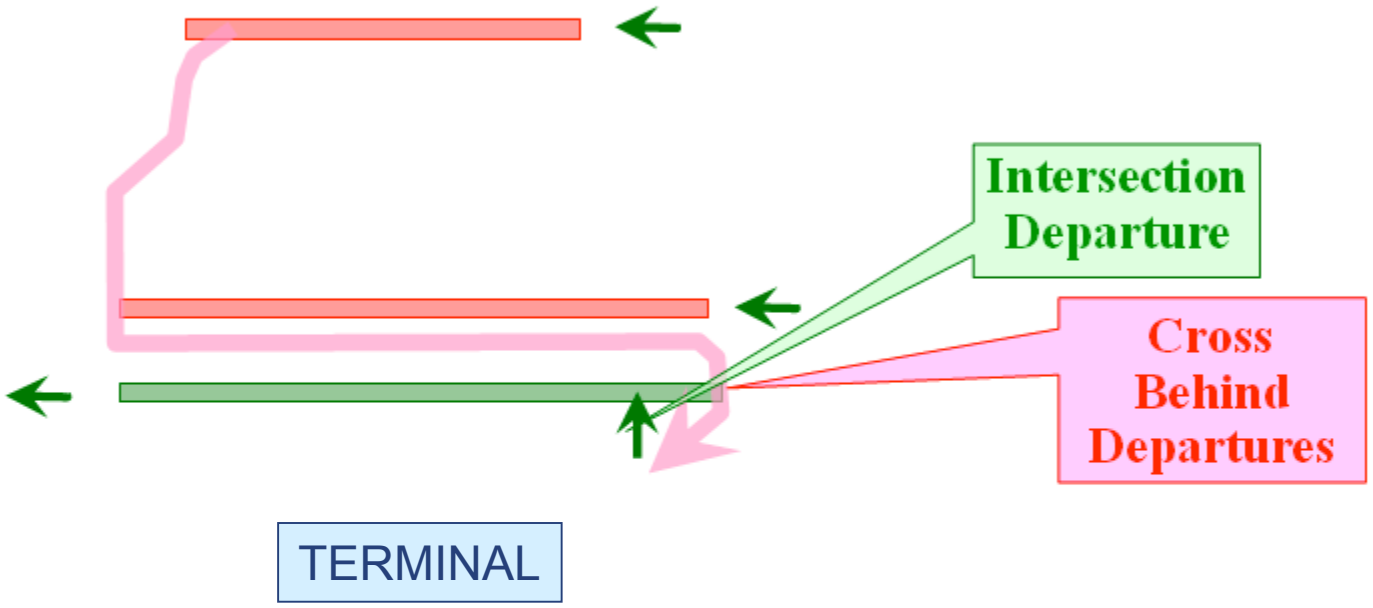
End Around Taxiways

ATL's Approved Design – Departure Ops Only

Source: City of Atlanta Department of Aviation

Surface Movement Strategy Changes

Generalized Case – In Limited Use in NAS



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